

Tedious Trudge Through The Torturous Turmoils of Taxonomy

by

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The naming of things is a fundamental aspect of human communication. We often do it spontaneously, adding adjectives and descriptors to common names for objects to indicate a specific item from a larger group. For example, if you are working on your car you might ask a friend to pass you the 'fat wrench'. This name might be adequate given the limited size of your tool kit. However, the same 'name' would not be expected to work if used in a well stocked hardware store. Clearly any given object may have more than one name. The best name to use at any time is determined by the needs and circumstances of the communication. As collectors and growers of CP we have a variety of plant names at our disposal. Some, like the fat wrench example above, are informal spontaneous names that remain associated with a plant only until the label is lost or the ink fades. However, some informal sounding names are in fact quite legitimate horticultural "Fancy Names." These names are governed by a completely different set of rules which will not be discussed here. Other names exist which are Latin, very formal sounding, i.e. hard to pronounce, and seem to be attached to a bewildering assortment of objects: botanical species, natural and horticultural hybrids, and groups of plants with no real status whatsoever. The main problem is the fact that there are many different kinds of names designed for different purposes. These have been created at various times in history and each author had different motives for creating a new name. By contrast the discipline of nomenclature, the study of formal naming, has evolved fairly recently. The net result is that when a name is used in

an inappropriate context it creates confusion rather than clarity, regardless of how 'formal' or valid it may be in a different context. Unfortunately, there is no reliable way that the function of a name can be assessed by inspection.

The important point to recognize is that all of these different names are either botanical names themselves, or are modifiers which are attached to a correct botanical species name for one reason or another. Therefore, the correct botanical species name can be considered basic. The proper formation and use of these names is governed by a complex body of rules which are reviewed and revised at an international meeting every four years. The scientists who derive and are governed by these rules are called taxonomists.

One of the basic tenets of botany is that each recognizable group of similar organisms—a species—must be assigned a single "correct" name that belongs to at least two higher "ranks" of relatives: the genus and family. The combined name consisting of a genus name and a species name is often called a binomial. By extension, two recognizably different groups must not be known by the same name. This lofty principle, so simple and elegant intellectually, is persistently difficult to translate into real world. This is primarily because the concept of the "recognizable group" is indefinable and subjective. Any newly proposed species can only be delimited by comparing and contrasting all of its characteristics with those characters known from other recognized species of the same genus. In publishing a new name, an author is only expressing that material exists which, in his

opinion, cannot be assigned to any other accepted species known to him. If the original publication meets the minimum standards for format, content and distribution (as set down by the International Code of Botanical Nomenclature) the species is said to be "validly published." The new name becomes "legitimate" at once and is assumed to be the "correct" name for the species until successfully challenged in the press. The challenge may come swiftly, particularly if the newly proposed species appears to be identical to another species that the original author did not consider. Alternatively, the new name may remain stable through generations of publications and through repeated use become accepted. Nevertheless, even well established names may be challenged. With the passage of time new material is collected and new knowledge about the characteristics of a species, and others with which it could be confused, becomes available. This accumulation of information then modifies the concept of "recognizability" and alters the perception of the species boundaries, which may require nomenclatural changes.

The above discussion of a species is of the type used by plant taxonomists when involved in their work. The study material is primarily dried plant specimens stored in herbariums (museums for dead plants). Confusion exists because other people (zoologists, botanists in other fields of study, commercial plant growers and hobbyists) use the same terms and names but define them differently. As a reader of CPN you will be better able to utilize the product of taxonomy correctly if you have an understanding of how this discipline is wired up and motivated. To do this we will be drawing examples from the genus *Nepenthes*. In the 230 year history of this genus over 200 legitimate names have accumulated of which about 70 are currently recognized as "correct." Sufficient examples of controversies, errors, reversals, and alterations have occurred to make the topic fun to discuss. The same could be said of the genus *Drosera*, but in our opinion that unwieldy group is almost too "interesting" for a paper of this size.

Recognizable Group

Are there such things in the real world a "recognizable groups" of *Nepenthes*, or are we dealing with a relatively small number of extremely variable species which have been assigned an inordinate number of names? Danser (1928, pg. 403) grappled with this problem and concluded that good specimens of closely related groups such as *N. albomarginata* Lobb, *N. gracilis* Korth., and *N. reinwardtiana* Miq. could be consistently differentiated from each other after careful study of the available material. In short, they were recognizable. Realizing that not everybody who was interested in *Nepenthes* would have access to good herbarium material for comparison, Danser published a series of consistent species descriptions which set the boundaries of each species as he perceived them. This type of publication is called a "monograph" or a "revision" and is the reference used by professionals when identifying a species. From our own field work, we would tend to agree with most of Danser's assessments. Some individual species of *Nepenthes* are remarkably polymorphic, but the observable variation in most cases does not overlap with that of another "correct" species. For example, *N. gracilis* can be found in Sumatra, the Malay Peninsula, Singapore, Borneo and Sulawesi, and the appearance of individual plants is variable. We even encountered variations which have not yet been documented in existing descriptions. It does not appear possible however to determine the geographical origin of a *N. gracilis* specimen by any combination of characters. This indicates to us that the observable variation is distributed throughout the known range of the species. The material we collected will produce a better understanding of the group, rather than demonstrating that the group was improperly delimited originally.

There are two observations which would seem to contradict the concept of the recognizable group in the Nepenthaceae. Firstly, most *Nepenthes* species can hybridize freely with other species, producing fertile offspring which will also freely cross. Secondly, pure seed from a single species mating produces offspring that are exceed-

ingly variable. We shall now explore these ideas more thoroughly.

Without question, some of the "correct" species names that we currently use will prove to be hybrids. *Nepenthes hookeriana* Lindl. was originally described as a species, and is now generally accepted to be a commonly occurring hybrid between *N. ampullaria* Jack and *N. rafflesiana* Jack. This realization does not modify the validity of the original publication, despite the fact that it was apparently based on an incorrect assumption. Only the rank of the name changes, and is now best referred to (under those conditions that require absolute precision) as *N. × hookeriana* Lindl. (*pro. sp.*) *emend.* Macf.. You can still get away with "*N. × hook.*" in the privacy of your own greenhouse, as the correct name won't fit on a reasonably sized label. The fact that a given hybrid may occur commonly is largely irrelevant if it has only been collected from areas where the range of both parents is known to overlap. It would appear that some insect pollinators which service two species frequently confuse the flowers of the plants in the field. If some insects are appallingly poor taxonomists, should it really degrade our perception of the status of the parents? Surely insects and humans view the universe quite differently, and we need not be restricted by their observations until they choose to publish.

The second objection to the concept of the recognizable group (regarding the surprising variability of plants from pure species seed) would appear to be more vexing. Firstly, it is quite possible to achieve very high survival rates for seed germinated in a greenhouse—well in excess of what can be expected in nature. It seems quite probable that some of the variants seen in the nurtured seedlings might not survive in the harsher conditions of the field. Greenhouse observed variations then gives us additional data on species variations more quickly (and possibly more economically) than field work, but whether it deserves the same level of distinction as data from the field is open to question. As stated earlier, when new information from any source alters the perception of a species bound-

aries, nomenclatural changes may be warranted. Experimental taxonomy is an important discipline, and can answer some questions that purely morphological observations do not completely resolve. Undoubtedly, everybody would be much more comfortable with the conversion of *N. hookeriana* from species to hybrid rank if the decision had been based on the observations of the appropriate cross. Nomenclatural changes would be required if it were found that seedlings from a single species mating or controlled interspecies cross consistently gave rise to small numbers of individuals which would normally have been identified as another validly published species.

Characteristics

If we can now agree that there are recognizable groups of *Nepenthes* in the wild, what characters are most acceptable to separate one group from another? On pages 255-6 of his monograph, Danser discusses the various characters he used: the shape of the pitcher's peristome, spur and lid; distribution, size and shape of glands; type of leaf base; leaf shape and venation; distribution and type of hairs; and flower form. These all appear to be more consistent within a group than pitcher colouration, leaf or pitcher size, and internode length—all of which appear to be environmentally controlled. No single character was found to be uniformly useful throughout the genus. This is not to say that the latter features are valueless, or the former will always prove useful. Notice that all of these features are morphological characters which can be easily tested on either living plants or herbarium specimens using simple equipment (i.e., hand lens and ruler). Characteristics which can only be measured or tested using elaborate equipment or requiring living specimens are admittedly a source of interesting data, but are not universally applicable and are therefore of less value taxonomically.

Taxonomy is not like the practice of law. Precedents play little part in delimiting a new species. Arguing that a specific character, say peristome shape, is variable in one species, or is useless in differentiating

species “A” from species “B” and “C” does not necessarily make it unreliable when considering a species “D” as it relates to “B” and “C”. One cannot work by formula. Experience with the genus does allow you to perceive differences more quickly, but the recognition of a new group is usually a slow process. Usually you become aware that the material under consideration is somehow “odd”; it does not fit the pattern of the other species studied. In an attempt to identify the material, you can generally eliminate most of the other species in the genus, bringing the selection down to two or three possible names. If you still cannot assign the new material to an appropriate group using the descriptions available you must then consult the actual herbarium material that had been the basis for the descriptions you had been using. Descriptions are a useful tool for identifying good specimens, but when you are faced with damaged material, or specimens that might represent a new group, they are not adequate. Only when you are satisfied that the material under consideration does not belong to an existing species do you start to clarify the feeling of “oddness” into a list of measurable or describable characters that, in your opinion, delimit the new species.

Publication

As we have already demonstrated, the products of nature cannot be judged by any set procedure or formula. The works of man can be. The formal publication of a new species name must follow a strict set of rules if the name is to become legitimate. Who then is entitled to publish? The answer is anybody—without regard to academic qualifications. There are abundant examples in the field of taxonomy where skilled amateurs have made significant contributions, while scientists with impeccable credentials have made blundering errors. Most biological publications do not make any reference to the academic status of the author(s). The work is to be judged solely on its content, not personal reputations.

A good example of a species introduction is *N. clipeata* Dans., published in Danser’s monograph on the Nepenthaceae (pg. 280-2). Danser did not personally discover this

species in the field. The original material that he worked with was a single collection of plants made by a Dutch botanist (B. Hallier) who had led an expedition through western Borneo in 1894. The collection consisted of only nine herbarium sheets all identified as #2344. These sheets are so outrageously different in appearance from all other described species of *Nepenthes* that one cannot imagine Danser spent too much time agonizing over whether he was justified in naming them. The disc-shaped leaves, with the pitcher bearing tendril inserted at their midpoint are features exaggerated to a degree unknown in any other species. Having satisfied himself that he was in possession of material representing an unknown species, what procedure did Danser follow to introduce and stabilize a new name?

The description itself is in Latin and starts with the proposed binomial, author’s name (often abbreviated) and a statement of taxonomic rank: “*Nepenthes clipeata* Dans. *spec. nova.*”. This is followed by a list of all the known references or illustrations previously published referring to the proposed species. In this case, Danser had previously discussed and illustrated Hallier’s collection in an earlier paper but made no attempt to name or formally describe it (Danser, 1927). The references are followed by a brief (less than 100 words) Latin description of Hallier’s material only. These nine sheets are then called the “Type Collection” and are adequately identified as such in the publication. This particular description is unusually brief. As mentioned earlier, there was very little material to describe, and the plant was so outrageous that a long wordy description was not needed to delimit it from all other known *Nepenthes*. The Latin description, along with the accompanying illustration, is the official type description for this species. The main purpose of the type description is to make it possible to replace the type collection with suitable material should the original material become lost or destroyed.

The next element in this publication is a modern language (in this case English) description of the plant. This section is optional, and is called an “expanded” or

“species” description. Here the author is free to speculate more on the material at hand, discuss other specimens that he believes are also of the same group, and mention any other data that is not specifically apparent in the type material. Specifically, Danser describes *N. clipeata* as “not climbing.” This is a statement that he could not know, as uncollected parts of the plant may in fact climb freely. This point is not a criticism of the publication, because this type of mild speculation and educated guesswork is appropriate, particularly when a species is described from a small amount of original material. The expanded description is meant to act as a guide for other botanists and students who lack Danser’s accumulated insight into the genus. For practical purposes, it is this description which is used to identify new material. The final section of the paper is the discussion. Here the author has complete freedom to discuss the new species, speculate on how it may be related to other members of the genus, and introduce any final item (such as growth habit or ecological data) which might also be available and of interest to readers.

Danser’s description of *N. clipeata* meets and exceeds the minimum standards for effective publication and distribution. This has some important ramifications. The name *N. clipeata* (along with the author’s name), the type collection (Hallier #2344) and the Latin description become permanently fixed, and must be dealt with by all serious students of the genus. A legitimate name can never “go away” or be separated from its type material. It is interesting to note that at the time that a new species is first proposed, it is in fact most poorly understood. It is quite possible that Halliere’s collection is not truly representative of the species as it exists in nature. Other populations of the same species may be found which demonstrate that the original material was dwarfed by the harsh environment (it was collected from a cliff face). This discovery would not affect the status of the type or the Latin description, but would probably necessitate a major revision of the species description.

Challenges

In the introduction we stated that over 200 legitimate names of *Nepenthes* have been published, yet only about 70 are currently accepted as correct. Since a legitimate name can never be disposed of, what heinous crimes were authors guilty of to have their creations considered less than correct? It is important to keep the concept of the name, which is governed by rules, separate in your mind from the concept of species, which is a measure of recognizability. Errors in either the formation of the name or the delimitation of the species force nomenclatural change. Most of the names which are now combined with others were originally proposed because poor communications allowed people to reuse names which had already been published. These names are known as “homonyms” and are permanently frozen when discovered. Further problems were caused by simple misinterpretations of the brief inadequate descriptions normally published at earlier times. Both the surprising variability of the genus and the quite different appearance of upper and lower sections of a plant caused confusion. People often mistakenly believed that they possessed something new when they did not. These names, known as “synonyms,” are also frozen upon discovery but, unlike homonyms, can occasionally be dragged out, warmed over, and served up for consumption by the botanical public. Some examples follow.

Korthals was the first person to publish validly the binomial *Nepenthes bongso* Korth. . In 1839 he applied it to a plant that is still recognized as a real species. Unfortunately, the publication that he used did not remain readily available to all interested parties, and the name proved to be unusually popular.

In 1908 when Ridley undertook to report on the Malaysian plants collected by two other botanists, he simultaneously named and described what he felt were two unique *Nepenthes*: *N. gracillima* Ridl. and *N. bongso* Ridl. . Danser later decided to unite these two species. Under normal circumstances he would have been free to choose either of the names for the combination. In this case, the choice was limited as *N. bongso* Ridl. was a later “homonym” for *N. bongso* Korth. . The

combined species could only be called *N. gracillima* Ridl.. Notice that Ridley's name remains with the binomial, not Danser's. This is because the type specimen (which Ridley described as *N. gracillima*) remains as an integral part of the newly combined species. All material that had been previously called *N. bongso* Ridl. would be re-determined as *N. gracillima* Ridl., but the type specimen of *N. bongso* Ridl. would remain the type for that name. The name itself is permanently frozen. Even if the status of *N. bongso* Korth. were changed, *N. bongso* Ridl. would remain an unusable homonym.

A similar case had its beginnings in 1911 when Guillaumin was confronted with what he felt was a new species from New Guinea. He also independently dreamt up the name *N. bongso* Guill. and applied it to his new taxa. Danser did not agree that *N. bongso* Guill. was sufficiently different from *N. vieillardii* Hook.f. to warrant its exclusion from that species. He combined them under the oldest valid name, *N. vieillardii* Hook.f., and *N. bongso* Guill. became a synonym. For the same reasons cited above the original author's name, in this case J.D. Hooker, remains with the valid binomial, and Guillaumin receives almost no credit for his work.

In the two cases above, Danser supplied a new complete description of the proposed combination. This is called a revised description. Another option he had was to write a species diagnosis. This is a minimum list of the characteristics which separate the combined species from all others. These diagnoses and descriptions are used to identify new material and are generally more useful than the original Latin type description. It is important to understand however that the original decision to combine the two species was based on a comparison of reliable herbarium material, not by a comparison of published descriptions. This is the only acceptable procedure for nomenclatural changes. Descriptions are too open to misinterpretations and are therefore not comparable. If the union of two species required considerable alterations in the

description of the combined species, Danser could have signified this by the addition of his name in the following manner: *N. gracillima* Ridl. *emend.* Dans; or *N. vieillardii* Hook. *f. emend.* Dans.. This would only be done where the combining author feels that the original published description was flawed or in some way misleading and that future workers would be best advised not to use it. The nature of the flaw would need to be explained.

Danser was not the first person to recognize the species we now know as *N. papuana* Dans. as unique. The species was first named *N. neoguineensis* Ridl. in 1916. Unfortunately, Ridley did not realize that MacFarlane had already utilized that binomial in a description of another New Guinea plant in 1911. Ridley's name was not valid because it was a later homonym, but his assessment of the species was vindicated by Danser. This presented a problem as there was now a published recognizable group, without a name. Danser resolved this by proposing an "avowed substitution" which is a new name applied to an established species (*N. papuana* Dans.). He described the plant, and his name, not Ridley's is used as the author. Ridley's type material automatically becomes the type for the new name also. Ridley was deprived of most of the credit for the find, by virtue that he had not done his nomenclatural homework adequately. Most people would erroneously assume that it was Danser who first named the plant, and recognize its status.

None of these combined species need be permanent. The *N. edwardsiana* Hook. *f.* : *N. villosa* Hook. *f.* controversy has created a paper blizzard of memorable proportions. Off to a shaky start, J.D. Hooker described *N. villosa* in 1852, and seven years later introduced *N. edwardsiana*, noting that it might be a mature form of the earlier species. In 1895 Beck formally combined the two species under the oldest name. The fact that the original collectors (Low, Burbidge, and St. John) had seen the plants in the wild and considered them to be different species, was ignored. Macfarlane split *N. edwardsiana* out of *N. villosa* in 1908 only to have it promptly re-combined by Danser

in 1928. Danser argued that the "edwardsiana form" was typical for the species, and the "villosa form" was more specialized, flowering in the juvenile state. Recently, Kurata re-split the two species based on field studies and by reference to the original descriptions (Kurata, 1976). Is the controversy over? Possibly, the situation seems satisfactory, but one never knows when the editorial artillery will be reloaded and fired. You can see from the above why a name can never be discarded, and why it must be associated with an author. Each name may form a part of an interlocking puzzle which can only be unravelled and understood if all of the pieces are present. If Beck had been entitled to obliterate permanently the name *N. edwardsiana* Hook.f. back in 1895 it would have created unnecessary confusion later.

When you accept that there is only one authentic specimen of each species, and it is the dead, dry type specimen, the problem of understanding taxonomy becomes easier. All other plants, either living or dead, have only been assigned the same name as the

type material that they most closely resemble. In practice, this assignment is usually made by comparing the characteristics of the unknown plants with the "best" published descriptions. Revised descriptions are only a guide to show what additional variation and features have become associated with a species name in the opinion of a particular authority. Ultimately, one must decide for himself which set of available descriptions is most uniformly useful, and therefore "best".

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